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THE NEWS LETTER

OF THE

BUREAU OF PUBLIC ROADS

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U. S. Department of Agriculture

VOL. 1, NO. 12

OCTOBER, 1926.

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THE FIFTH INTERNATIONAL ROAD CONGRESS

EXTRACTS FROM AN ARTICLE BY THOS. H. MACDONALD, CHIEF OF THE BUREAU, WHICH WILL APPEAR IN AN EARLY ISSUE OF THE ENGINEERING NEWS-RECORD.

"FIFTY NATIONS OF FIVE CONTINENTS, REPRESENTED BY A REGISTRATION OF SOME TWENTY-THREE HUNDRED DELEGATES, OFFICIAL AND UNOFFICIAL, CONTRIBUTED EACH ITS GENEROUS SHARE TO MAKE THE FIFTH INTERNATIONAL ROAD CONGRESS TRULY REFLECT THE MAJOR POSITION HIGHWAYS ARE OCCUPYING IN THE WHOLE WORLD'S SCHEME OF TRANSPORT.

"THIS CONGRESS, IN RESPONSE TO THE GRACIOUS INVITATION OF THE ITALIAN GOVERNMENT, MET IN MILAN ON SEPTEMBER 6TH, CONTINUED THERE UNTIL SEPTEMBER 10TH, THEN ROSE TO MEET IN ROME FOR THE FINAL THREE DAYS' PROGRAM."

* * * * *

"AFTER THE FIRST SESSION, FOR THE DETAILED CONSIDERATION OF THE WORK BEFORE THE CONGRESS, THE DELEGATES SEPARATED INTO TWO SECTIONS, EACH TO CONSIDER THREE MAJOR SUBJECTS. TO THE FIRST SECTION THE GENERAL REPORTERS PRESENTED THEIR CONCLUSIONS RELATING TO CONSTRUCTION, MATERIALS AND DESIGN, WHILE SIMULTANEOUSLY TO THE SECOND SECTION THEY PRESENTED THOSE PERTAINING TO CITY PLANNING, TRAFFIC CENSUS, AND THE 'AUTOSTRADE', OR ROADS BUILT AND RESERVED FOR THE EXCLUSIVE USE OF THE MOTOR VEHICLE.

"IN THE FIRST SECTION, PERHAPS THE SHARPEST DEBATE CAME UPON THE RELATIVE MERITS OF TAR AND ASPHALTS. IN THE SECOND SECTION, THE MOST IMPORTANT DIVISION OF OPINION CAME UPON THE PUBLIC POLICY INVOLVED IN THE GRANTING OF FRANCHISES TO PRIVATE CORPORATIONS TO BUILD EXCLUSIVE MOTOR TOLL ROADS OR AUTOSTRADE. AN IMPORTANT RESOLUTION FROM THE SECOND SECTION CALLED UPON THE PERMANENT ASSOCIATION TO ESTABLISH AN INTERNATIONAL COMMITTEE TO FORMULATE INTERNATIONAL RULES OR STANDARDS FOR THE TRAFFIC CENSUS FOR THE PURPOSE OF REDUCING TRAFFIC RECORDS AND MEASUREMENTS TO A COMPARABLE BASIS.

"TO THE AMERICAN DELEGATION PERHAPS THE MOST WELCOME OF ALL THE ATTENTIONS WHICH WERE GENEROUSLY SHOWERED UPON THE DELEGATES BY THEIR ITALIAN HOSTS WERE THE FINAL WORDS OF PRESIDENT LUIGI LUIGGI WHEN HE SAID, 'I WILL NOT SAY GOODBYE BUT RATHER, AU REVOIR, UNTIL, AS I HOPE, WE MEET FOR THE NEXT CONFERENCE IN THE UNITED STATES.'"

* * * * *

"A FULL SET OF PAPERS HAD BEEN PREPARED BY THE ENGINEERS OF THE UNITED STATES UNDER THE LEADERSHIP OF A COMMITTEE MADE UP OF A. B. FLETCHER, CHAIRMAN, DEAN A. N. JOHNSON, H. ELTINGE BREED, WALTER W. CROSBY, AND ARTHUR W. DEAN. THESE PAPERS CONSTITUTED THE MOST COMPLETE RESPONSE OF ANY COUNTRY AND THEY PRESENT A NOTEWORTHY CONTRIBUTION TO THE AVAILABLE WORKS ON HIGHWAY ENGINEERING AND MODERN HIGHWAY TRANSPORT. MANY FAVORABLE COMMENTS WERE MADE BY THE ENGINEERS OF OTHER COUNTRIES UPON THE VALUE OF THESE PAPERS TO THEM. IT WAS EVIDENT THAT AUTHENTIC MATERIAL UPON HIGHWAY SUBJECTS PREPARED BY THE LEADING HIGHWAY ENGINEERS OF THE UNITED STATES RECEIVED WIDE ATTENTION AND THE MOST SERIOUS CONSIDERATION OF THE ENGINEERS OF FOREIGN COUNTRIES.

"SOMEWHAT ASIDE FROM THE SUBJECT IT MAY BE REMARKED THAT THE ENGINEERS OF OTHER NATIONALITIES ARE UNDOUBTEDLY MORE EAGER AND MORE CONSCIENTIOUS STUDENTS OF THE CURRENT ENGINEERING LITERATURE OF OTHER COUNTRIES THAN IS TRUE GENERALLY OF OUR OWN ENGINEERS. THE CONCLUSIONS REACHED BY THE GENERAL REPORTERS REFLECTED A CAREFUL CONSIDERATION OF THE PAPERS AND ALTHOUGH SOME CHANGES WERE MADE AS THESE CONCLUSIONS WERE PRESENTED TO THE TWO SECTIONS OF THE CONGRESS, IN THE MAIN THEY RECEIVED A FAVORABLE VOTE AND THUS BECAME THE FINAL CONCLUSIONS. THEY MAY BE CHARACTERIZED AS A CAREFUL BUT PERHAPS CONSERVATIVE EXPRESSION OF THE BEST ACCEPTED THOUGHT AND PRACTICE IN THE TECHNIQUE OF HIGHWAY ENGINEERING. THEY MAY BE OPEN TO THE SUGGESTION THAT THEY ARE BASED TOO MUCH UPON THEORY AND LACK SOMEWHAT THE PRACTICAL CHARACTER OF CONCLUSIONS DRAWN FROM BROAD AND LONG EXPERIENCE.

"THE VERY IMPORTANT OMISSION IN THE PROGRAM WAS THE DISREGARD OF THE ECONOMIC ENGINEERING PHASES. THE HIGHWAY ITSELF IS GIVEN TOO MUCH ATTENTION. THE KIND, QUALITY, AND QUANTITY OF SERVICE REQUIRED OR THAT MAY BE RENDERED IS OF GREATER IMPORTANCE. ALSO THE RELATIONSHIP OF HIGHWAY TRANSPORT TO OTHER TRANSPORT AGENCIES RECEIVED NO CONSIDERATION. LOOKING BACK UPON THE EXPERIENCE IN THE UNITED STATES IT WAS THE TREMENDOUS GROWTH IN HIGHWAY UTILIZATION THAT DROVE THE ENGINEERS FROM THE MORE MECHANICAL ASPECTS TO THE ECONOMIC REGARD OF HIGHWAYS AND AWAY FROM DEBATING OVER THE QUALITIES OF VARIOUS TYPES OF ROADS TO A STRUGGLE TO MAINTAIN HIGHWAY SERVICE FAIRLY ACCEPTABLE TO THE PUBLIC. COINCIDENTALLY THE HIGHWAY ADMINISTRATORS FIND THEMSELVES CONFRONTED WITH THE NECESSITY OF KEEPING IN HARMONY WITH OTHER TRANSPORT AGENCIES, NOTABLY THE ELECTRIC AND STEAM

RAILROADS, THROUGH A RESPECT FOR THE SERVICE RENDERED BY THEM AND AN ACCEPTANCE OF THE LIMITATIONS OF ECONOMIC HIGHWAY TRANSPORT. THE MILAN PROGRAM CARRIED NO SUBJECTS DEALING WITH THESE PHASES WHICH ARE THE INEVITABLE OFFSPRING OF A TREMENDOUS HIGHWAY TRAFFIC. THERE IS NO MORE SIGNIFICANT EVIDENCE OF THE GREAT DIFFERENCE THAT EXISTS BETWEEN THE UNITED STATES AND OTHER COUNTRIES IN THE DEGREE OF UTILIZATION OF HIGHWAY TRANSPORT. EUROPE IS STILL REGARDING THE MOTOR VEHICLE AS A LUXURY RATHER THAN A GENERAL PUBLIC UTILITY. EUROPEAN ENGINEERS BELIEVE THE MOTOR VEHICLE WILL HAVE A BIG FUTURE BUT THE PUBLIC DOES NOT. SO THE PROGRAMS OF THE CONFERENCE REFLECT PERHAPS THE CONVENTIONAL TECHNICAL ASPECTS RATHER THAN THE PROBLEMS WHICH WILL DOMINATE WITH THE INTENSIVE DEVELOPMENT OF HIGHWAY TRAFFIC.

"THERE IS NO BETTER ILLUSTRATION OF THE DIFFERENCE IN VIEWPOINT BETWEEN THE UNITED STATES AND ITALY, FOR EXAMPLE, THAN THE CIRCUMSTANCES OF THE 'AUTOSTRADA.' HERE IS A TOLL ROAD RESERVED EXCLUSIVELY FOR MOTOR TRAFFIC, BUILT BY PRIVATE CAPITAL UNDER STATE FRANCHISE TO EXTEND FOR FIFTY YEARS.

IT IS LAID OVER AN ENTIRELY NEW RIGHT OF WAY, WITHOUT INTERSECTIONS AT GRADE, NO SPEED LIMIT, AMPLE WIDTH, CONCRETE PAVEMENT WITH BITUMINOUS SKIN COAT, EASY CURVES, SUPERELEVATED. IN FACT EVERY PROVISION IS MADE FOR FAST TRAFFIC BETWEEN TERMINI. THE ITALIAN COMMITTEE PROPOSED THE 'AUTOSTRADA' AS ONE OF THE SIX SUBJECTS FOR DISCUSSION BEFORE THE CONGRESS. AS DEVELOPED BY THE GENERAL REPORTER, SR. ISACCO, THE CHIEF OF THE FEDERAL HIGHWAY DIVISION, THE MATTER PRESENTED ENCOMPASSED BOTH THE PUBLIC POLICY INVOLVED IN GRANTING PRIVATE FRANCHISES FOR TOLL ROADS WITH POWER TO EXCLUDE ALL BUT MOTOR TRAFFIC, AND ALSO THE ENGINEERING CONCEPTION OF THE HIGHWAY ITSELF AND ITS OPERATION. WHEN THIS DUAL ASPECT WAS PRESENTED TO THE SECOND DIVISION IN AN INTERDEPENDENT RELATION, BOTH THE ENGLISH AND THE UNITED STATES DELEGATIONS FOUND THEMSELVES IN A SOMEWHAT EMBARRASSING POSITION. ALL THE TRADITIONS OF ENGLISH SPEAKING PEOPLE DEMAND FREEDOM OF THE HIGHWAYS. THEY ARE OPPOSED TO ANY CONCEPTION OF THE HIGHWAY WHICH INVOLVES THE EXCLUSION OF ANY KIND OR TYPE OF TRAFFIC THAT MAY DEMAND SERVICE. TO THEM THE EARLIEST MEANING OF THE HIGHWAY WAS NOT A PHYSICAL THING BUT RATHER A RIGHT - THE RIGHT TO PASS. THE TOLL FEATURE IS NOT SO FOREIGN TO OUR TRADITIONS SINCE TOLL ROADS HAVE BEEN SOMEWHAT WIDELY USED DURING OUR PAST HISTORY; BUT THE OLD METHOD OF COLLECTING TOLLS AT TOLL GATES HAS SERVED ITS PURPOSE, SPEAKING GENERALLY, AND IS NO LONGER FAVORED. WITH THIS COMMON BACKGROUND THE ENGLISH AND UNITED STATES DELEGATIONS FOUND THEMSELVES UNABLE TO ACCEPT THE PUBLIC POLICIES SUGGESTED

FOR GENERAL APPROVAL. ON THE OTHER HAND THE ENGINEERING CONCEPTION OF THE PLAN WAS COURAGEOUS AND HIGHLY REPRESENTATIVE OF THE BEST PRACTICE IN THE DESIGN OF MODERN MOTOR ROADS. BOTH OF THE DISSENTING DELEGATIONS, UNDOUBTEDLY, WOULD GLADLY HAVE COMPLIMENTED AND ENDORSED THE ENGINEERING CONCEPTION HAD THIS ASPECT ALONE BEEN PRESENTED. UNDER THE CIRCUMSTANCES, THE DELEGATIONS WITHHELD THEIR VOTE WITH THE EXPRESSED HOPE THAT AT A FUTURE CONFERENCE THE BENEFIT OF THE FINANCIAL DETAILS OF THE OPERATION OVER A NUMBER OF YEARS MIGHT BE AVAILABLE. THIS BRIEF DISCUSSION DOES SCANT JUSTICE TO A REALLY REMARKABLE DEVELOPMENT. THE AUTOSTRADA COMPLETED IS MORE THAN FIFTY MILES IN LENGTH AND GIVES QUICK AND LUXURIOUS ACCESS FOR MILAN, A RICH MANUFACTURING CITY OF PERHAPS ONE AND ONE QUARTER MILLIONS TO THE BEAUTIFUL LAKES OF COMO, VARESE, MAGGIORE, AND THE HIGHER ALTITUDES SURROUNDING THEM, TUCKED AWAY IN THE MOUNTAINS AS THEY ARE. THE CONDITIONS ARE EXCEPTIONAL AND WHILE SCARCELY AFFORDING PROOF OF THE SOUNDNESS OF THE PRINCIPLE OF THE AUTOSTRADA FOR GENERAL APPLICATION, AS HERE WORKED OUT THE RESULT IS ONE OF WHICH THE ITALIAN PEOPLE MAY WELL BE PROUD, AND THEY ARE. THE WHOLE PROJECT CERTAINLY REFLECTS GREAT CREDIT UPON THOSE WHO CARRIED IT THROUGH."

DISTRICT ENGINEERS' CONFERENCE

THE DISTRICT ENGINEERS OF THE BUREAU AND REPRESENTATIVES FROM THE REGIONAL OFFICE WILL MEET WITH THE BUREAU OFFICIALS OF THE HEADQUARTERS OFFICE IN WASHINGTON, D. C., DURING THE WEEK BEGINNING NOVEMBER 15, 1926. THIS WILL BE SUBSEQUENT TO THE ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS WHICH WILL BE HELD AT PINEHURST, NORTH CAROLINA, FROM NOVEMBER 8 TO 12, INCLUSIVE.

A TENTATIVE PROGRAM FOR THE MEETING HAS BEEN ARRANGED WHICH MAY REQUIRE TWO OR THREE DAYS DISCUSSION. DURING THE SAME WEEK BEGINNING NOVEMBER 15, A MEETING OF THE WESTERN DISTRICT ENGINEERS AND REPRESENTATIVES OF THE REGIONAL OFFICE WILL BE HELD WITH THE SUPERINTENDENTS OF THE SEVERAL NATIONAL PARKS TO DISCUSS ROAD CONSTRUCTION BY THE BUREAU IN THESE FEDERAL AREAS. THIS CONFERENCE HAS BEEN MADE POSSIBLE BY THE PLANS OF THE PARK SERVICE OF THE INTERIOR DEPARTMENT WHICH CALL FOR A MEETING OF ALL NATIONAL PARK SUPERINTENDENTS IN WASHINGTON, D. C., DURING THIS WEEK.

SNOW REMOVAL PROBLEMS AND EQUIPMENT

CONTRIBUTED BY H. G. MCKELVEY OF THE DIVISION OF CONSTRUCTION

SNOW REMOVAL FROM RURAL HIGHWAYS CONTINUES TO GROW IN POPULARITY AND ACTIVITY IN PROPORTION THAT THE TRAVELING PUBLIC AND BUSINESS INTERESTS COME TO REALIZE THE INNUMERABLE BENEFITS POSSIBLE FROM OPEN ROADS DURING THE WINTER SEASONS. HIGHWAY OFFICIALS REPRESENTING THE THIRTY-SIX SNOW STATES REPORT TO THE BUREAU OF PUBLIC ROADS THAT THE ROADS CLEARED IN TERMS OF MILEAGE DURING THE PAST WINTER WERE INCREASED APPROXIMATELY 50 PER CENT OVER THE ROADS CLEARED DURING THE WINTER PRECEDING; AND THE SAME OFFICIALS REPORT A STILL MORE EXTENSIVE PROGRAM FOR THE APPROACHING SNOW SEASON. DURING THE WINTER UNDER DISCUSSION - 1925-26 - THERE WAS GREATER THAN ONE-THIRD MILLION MILES OF PAVED ROADS IN EXISTENCE OVER THE THIRTY-SIX SNOW STATES; AND MORE THAN SIXTEEN MILLION, OR 66 PER CENT OF ALL THE MOTOR VEHICLES ON THE GLOBE, WERE UNDER REGISTRATION IN THE SAME TERRITORY. NEITHER THE FIRST COST OF THE PAVED MILEAGE QUOTED NOR THE AMOUNT NECESSARY FOR ITS MAINTENANCE IS AVAILABLE, BUT THE PURCHASE COST OF THE MOTOR VEHICLES EXCEEDED FOURTEEN AND ONE-HALF BILLION DOLLARS, AND OVER FOUR BILLION DOLLARS ARE REQUIRED ANNUALLY FOR THEIR UPKEEP. WITH THIS IMPROVED SYSTEM OF HIGHWAYS AND ENORMOUS SUMS INVESTED IN MOTORS, THE PUBLIC IS DEMANDING MORE MILES OF OPEN ROADS FOR WINTER TRAFFIC YEAR BY YEAR. IT IS APPARENT THAT SNOW REMOVAL WORK WILL NOT HAVE REACHED ITS GREATEST MAGNITUDE UNTIL NEARLY ALL PAVED ROADS AND THEIR CONNECTING LINKS ARE KEPT CLEAR THE YEAR ROUND. WHEN THIS IS DONE THE PUBLIC THROUGHOUT THE SNOW AREA WITH THEIR IMPROVED HIGHWAYS AND VAST FLEET OF MOTOR VEHICLES MAY BENEFIT ALIKE WITH OTHER SECTIONS OF THE COUNTRY.

SNOWFALL

WINTER MAINTENANCE ORGANIZATIONS SURELY HAVE ENOUGH SNOW TO CONTEND WITH AT TIMES, BUT THE DEPTH OF INDIVIDUAL SNOWFALLS ARE OFTEN GREATLY EXAGGERATED. AFTER A STORM, WITH THE IMMEDIATE LANDSCAPE COVERED AND SNOW EVERYWHERE, IT IS CONCLUDED THAT 8, 10 OR 12 INCHES OF SNOW HAS FALLEN, WHILE AS A MATTER OF FACT, PROBABLY LESS THAN HALF OF THOSE DEPTHS ACTUALLY OCCURRED. FROM A STUDY OF UNITED STATES WEATHER BUREAU RECORDS COMPILED FROM TWELVE WEATHER BUREAU STATIONS SCATTERED OVER THE EASTERN UNITED STATES IN THE HEAVY SNOWFALL AREA, WITHOUT PAYING ANY ATTENTION TO STORMS WITH SNOW LESS THAN 2 INCHES DEEP, IT IS LEARNED THAT BY FAR THE GREATEST NUMBER OF STORMS DEPOSIT SNOW

BETWEEN TWO AND THREE INCHES DEEP OR BETWEEN THREE AND FIVE INCHES DEEP, WITH THOSE FALLING BETWEEN FIVE AND SEVEN INCHES DEEP MATERIALLY FEWER IN NUMBER, AND STORMS WITH RESULTANT SNOWFALLS OF SEVEN TO NINE INCHES OR GREATER THAN NINE INCHES DEEP, COMPARATIVELY INFREQUENT. OR, IN TERMS OF PERCENTAGE, 33 PER CENT OF THE STORMS DURING THE FOUR SEASONS STUDIED, DEPOSITED SNOW TWO TO THREE INCHES DEEP; 29 PER CENT DEPOSITED SNOW THREE TO FIVE INCHES DEEP; 22 PER CENT DEPOSITED SNOW FIVE TO SEVEN INCHES DEEP; 8 PER CENT SEVEN TO NINE INCHES DEEP; AND 8 PER CENT GREATER THAN NINE INCHES DEEP. THE STATIONS FROM WHICH THESE DATA WERE COMPILED WERE SELECTED MORE OR LESS AT RANDOM, BUT CARE WAS EMPLOYED TO AVOID MOUNTAINOUS REGIONS.

DRIFT PREVENTION

IF SNOW WOULD LIE AS IT FALLS, LITTLE EFFORT GENERALLY WOULD BE NECESSARY TO REMOVE IT FROM THE ROADBEDS AND KEEP ARTERIAL AND LATERAL HIGHWAYS OPEN THE YEAR ROUND FOR THE EVER INCREASING WHEEL TRAFFIC. WITH SNOW FALLING BUT RARELY TO A DEPTH GREATER THAN NINE INCHES IN NON-MOUNTAINOUS REGIONS FOR INDIVIDUAL STORMS, WERE IT TO SPREAD UNIFORMLY ON FIELD AND ROAD AND REMAIN IN THAT LAMINATED STATE, THE ONLY EQUIPMENT NECESSARY FOR ITS REMOVAL OR DISPLACEMENT WOULD BE THE SIMPLY CONSTRUCTED AND LOW PRICED STRAIGHT BLADE PLOW, USED IN CONNECTION WITH THE HIGH SPEED TRUCKS; OR, IN NUMEROUS INSTANCES, NONE OTHER THAN THE ORDINARY MAINTENANCE EQUIPMENT INCLUDING ROAD GRADERS AND TRUCKS. BUT, UNFORTUNATELY, SNOWFALL IS USUALLY ACCOMPANIED BY HIGH WINDS WHICH BUFFET THE LIGHT SNOW CRYSTALS ABOUT IN MERCELESS CONFUSION, AND WHERE OBSTACLES ARE ENCOUNTERED ALONG THE HIGHWAYS WHICH BREAK THE WIND CURRENTS, DRIFTS ARE FORMED ON THE TRAVELED WAY. CONSEQUENTLY, AS AN OUNCE OF PREVENTION IS CLAIMED TO BE WORTH A POUND OF CURE, THE FIRST PROBLEM TO BE SOLVED IN KEEPING ROADS OPEN DURING THE SNOW SEASON, AND THE GREATEST ONE, IS THE PREVENTION OR CONTROL OF DRIFTING CONDITIONS. SNOW DRIFTS ARE FORMED BY OBSTACLES ENCOUNTERED IN THE PATH OF THE SNOW LADEN AIR CURRENTS IN THE FORM OF HIGH WINDS. THESE OBSTACLES BREAK THE FORCE OF THE WIND; REDUCE ITS VELOCITY; FORM POCKETS OF STILL AIR TO THE LEE OF THE OBSTACLES; AND, DUE TO THE ABSENCE OF AIR AGITATION IN THE RESULTANT POCKETS OR PROTECTED AREAS, PERMIT THE SNOW FLAKES TO FALL AND REMAIN UNDISTURBED. DRIFTING CONDITIONS ARE PREVENTABLE IN MANY WAYS, BUT TO CONTROL THE DRIFTS, ARTIFICIAL STRUCTURES ARE ERECTED ALONG DRIFT LADEN SECTIONS IN SUCH POSITIONS AS TO FORM EDDIES ON THE WINDWARD SIDE OF THE ROAD TO BE PROTECTED AND AT JUST THE DISTANCE AWAY TO PERMIT THE BLOWING SNOW TO BE DEPOSITED BETWEEN THE

STRUCTURE AND THE ROAD. FOR CONVENIENCE, SUCH STRUCTURES ARE TERMED SNOW FENCES. SNOW FENCES OF VARIOUS DESIGN ARE EMPLOYED IN ALL SECTIONS OF THE COUNTRY WHEN SNOW DRIFTING IS EXPERIENCED, AND WITHOUT EXCEPTION ARE FAVORABLY REPORTED FOR PROTECTION OF TRAVELED WAYS WHEN THE FENCES ARE PLACED IN THE PROPER POSITION RELATIVE TO THE ROADS INVOLVED AND IN THE GENERAL DIRECTION OF THE PREVAILING WINDS. TO LOCATE THESE DRIFT LADEN SECTIONS OF HIGHWAYS, AND STUDY THE PREVALENT DIRECTION OF WIND AND THE TOPOGRAPHY IN CLOSE PROXIMITY TO THE TRAVELED WAY, ARE THE MAIN PROBLEMS ENCOUNTERED IN THE CONTROL OF SNOW ADJACENT TO RURAL ROADS. TAKEN TOGETHER THESE PROBABLY REPRESENT THE MOST IMPORTANT STUDY IN CONNECTION WITH SNOW REMOVAL AND DRIFT PREVENTION.

EQUIPMENT

THE EQUIPMENT USED IN THE REMOVAL AND DISPOSAL OF SNOW FOR THE CONVENIENCE OF WINTER TRAFFIC REMAINS ESSENTIALLY THE SAME AS THAT EMPLOYED DURING RECENT WINTERS. THE STRAIGHT BLADE AND THE MEDIUM SIZE "V" SHAPE PLOWS ARE USED QUITE EXTENSIVELY WHEN MOUNTED ON HIGH SPEED TRUCKS FOR KEEPING ROADS OPEN, ESPECIALLY WHERE THE WORK IS STARTED SHORTLY AFTER THE COMMENCEMENT OF THE STORM AND PERSISTENTLY FOLLOWED UNTIL THE SNOWFALL STOPS AND THE PROGRAM IS CLEARED. FOR HEAVIER WORK, IN OPENING DRIFTED OR PACKED SECTIONS OF ROADWAY, OR FOR WIDENING CUTS ALREADY MADE, THE MORE POWERFUL DISPLACEMENT PLOWS WITH TRACTORS ARE UTILIZED, OR THE DIFFERENT TYPES OF ROTARY PLOWS ARE EMPLOYED FOR THE SAME PURPOSE. WHILE SOME ENGINEERS IN THE HEAVY SNOWFALL AREAS BELIEVE THE TRACTOR PLOWS BEST ADAPTED FOR OPENING ROADS DURING AND FOLLOWING STORMS, THE MAJORITY IN BOTH LIGHT AND HEAVY SNOWFALL SECTIONS BELIEVE THE STRAIGHT BLADE AND "V" SHAPED TRUCK PLOWS THE MORE EFFICIENT AND ECONOMICAL FOR QUICK WORK. THE HEAVY TRACTOR PLOWS ARE CAPABLE OF "OPENING ROADS" FOR WINTER TRAFFIC, BUT THE LIGHTER HIGH SPEED TRUCK PLOWS CAN KEEP THE ROADS OPEN DURING STORMS WHICH IS THE RESULT DESIRED. A COUNTY OFFICIAL OF THE UPPER PENINSULA OF MICHIGAN WHERE THERE IS AN AVERAGE ANNUAL SNOWFALL OF 99 INCHES AND A SEASONAL PROGRAM OF 125 MILES TO KEEP CLEAR, EMPLOYS EXCLUSIVELY FOR INITIAL CUTS 36-INCH HIGH STRAIGHT BLADE AND "V" PLOWS WITH TRUCK MOUNTS. THESE OUTFITS CAN TRAVEL THROUGH SNOW OF ORDINARY DEPTHS AT THE RATE OF 10 MILES PER HOUR AND ARE CAPABLE OF CLEARING WIDE TRAVELED WAYS QUICKLY AND CHEAPLY. A COUNTY ENGINEER IN CENTRAL NEW YORK, A LOCALITY WITH CONSIDERABLE SNOW, HAS GIVEN SNOW REMOVAL CAREFUL STUDY, AND BELIEVES THAT LIGHT "V" PLOWS EMPLOYED WITH TRUCKS ARE THE MOST SATISFACTORY FOR OPENING PRELIMINARY CUTS DURING STORMS. THE TRUCKS CARRY "V"



FIGURE 1. END VIEW OF SNOW FENCE WITH RESULTANT DRIFT, THE PROTECTED ROADWAY IS AT THE RIGHT BEYOND THE TELEGRAPH POLES.



FIGURE 2. VIEW OF THE LEE SIDE OF DRIFT SHOWN BY FIGURE 1, WITH THE ROADWAY COMPARATIVELY FREE OF SNOW.

PLOWS IN FRONT, AND ALSO ATTACHED TO ONE SIDE OR THE OTHER, AUXILIARY WINGS TO WIDEN THE CUTS. FIGURE 3 IS A VIEW OF A TRUCK MOUNTED PLOW WITH AUXILIARY WING USED QUITE EXTENSIVELY IN CENTRAL AND NORTHERN NEW YORK. THE MINNESOTA HIGHWAY DEPARTMENT, AND ALSO CERTAIN COUNTIES IN THAT STATE, USE THE LIGHTER TYPE OF EQUIPMENT IN THEIR SNOW REMOVAL ACTIVITIES. FOR SOME LOCALITIES, HOWEVER, THE TRUCKS ARE EMPLOYED IN TANDEM FORMATION; THE FORWARD TRUCKS CARRY "V" PLOWS AND THE REAR TRUCKS HAVE WINGS ATTACHED TO THEIR RIGHT SIDES. THESE OUTFITS ARE CAPABLE OF TRAVELING 12 MILES PER HOUR WHILE CLEARING 12 INCHES OF SNOW. FIGURE 4 IS A VIEW OF THIS TYPE OUTFIT AS USED BY RAMSEY COUNTY, MINNESOTA.

THE ENGINEERS IN THE LOCALITIES WITH TRUCK PLOWS IN OPERATION, CONTEND THAT IT TAKES A FAST MOVING SNOW REMOVAL OUTFIT TO KEEP AHEAD OF A HEAVY SNOWFALL AND THAT STORMS ARE SELDOM EXPERIENCED OF SUCH VIOLENCE AS TO SNOW IN A TRUCK PLOW UNIT, PROVIDED THE TRUCK IS IN A SUITABLE CONDITION AND THE PERSONNEL EFFICIENT. THEY ALSO REPORT THAT TRUCKS WITH PLOW MOUNTS CAN TRAVEL AT HIGH SPEED WHILE CLEARING AN ORDINARY SNOWFALL BETWEEN DRIFTS AND THEN BUCK THE DEEPER DRIFTS, BUT A TRACTOR CAN MAINTAIN BUT A COMPARATIVELY SLOW SPEED EVEN WITH LITTLE OR NO SNOW ENCOUNTERED BETWEEN THE DEEPER SECTIONS. NEARLY ALL OF THE STATE OFFICIALS IN THE HEAVY SNOWFALL AREA OF THE COUNTRY REPORT THAT NEWLY FALLEN SNOW TO A DEPTH OF NINE INCHES, AND RECENTLY DRIFTED BUT NOT PACKED OR CRUSTED SNOW TO A DEPTH OF 36 INCHES OVER SHORT SECTIONS, CAN BE EFFICIENTLY MOVED WITH TRUCK PLOWS. THE RECORDS OF THE UNITED STATES WEATHER BUREAU SUPPLY THE INFORMATION THAT SNOW FALLING TO A DEPTH GREATER THAN NINE INCHES IS OF RARE OCCURRENCE, AND OF THOSE THAT DO FALL GREATER THAN THAT DEPTH, BUT VERY FEW OF THEM OCCUR WITHIN A SINGLE 24-HOUR PERIOD. FROM THE ABOVE FACTS IT APPEARS THAT THE PROBLEM OF "OPEN ROADS FOR WINTER TRAFFIC" AT THE MINIMUM EXPENSE MAY BE SOLVED TO A GREATER OR LESS EXTENT BY THE EFFECTUAL USE OF SNOW FENCES AND OTHER METHODS OF DRIFT PREVENTION AT LOCATIONS DETERMINED AFTER CAREFUL SURVEYS, AND THE EMPLOYMENT OF AS NUMEROUS A FLEET OF THE LIGHTER TYPE OF PLOWS AS THE TRUCKS AVAILABLE WILL PERMIT. THE EQUIPMENT SHOULD BE PLACED IN ACTION BY A CAREFULLY SELECTED AND EFFICIENT PERSONNEL AT THE BEGINNING OF EACH STORM, OR SHORTLY THEREAFTER, AND KEPT CONSTANTLY EMPLOYED IN SUCCEEDING SHIFTS UNTIL THE ENTIRE PROGRAM ADOPTED IS OPENED AND MADE PASSABLE FOR ALL TYPES OF WINTER TRAFFIC AND IN THE LEAST TIME POSSIBLE.



FIGURE 3. A DISPLACEMENT PLOW FOR TRUCK MOUNT. ONE OF MANY DESIGNS SUITABLE FOR TRUCK MOUNT.



FIGURE 4. "V" PLOW WITH TRUCK MOUNT IN TANDEM FORMATION, USED BY RAMSEY COUNTY, MINNESOTA.



FIGURE 5. A STURDY DISPLACEMENT PLOW OPERATED BY MARQUETTE COUNTY, MICHIGAN. THE PLOW IS USUALLY HAULED BY TWO TRACTORS AND THE OUTFIT CAN TRAVEL AT THE RATE OF APPROXIMATELY FIVE MILES PER HOUR.



FIGURE 6. A CLOSE-UP REAR VIEW OF THE PLOW SHOWN BY FIGURE 5. THE OUTFIT IS USUALLY MANNED BY A DRIVER FOR EACH OF THE TRUCKS, TWO EXTRA MEN TO HANDLE THE WINGS, AND A FOREMAN.

IT IS NOT INTENDED TO IMPLY BY ANY MEANS THAT THE HEAVIER TYPE OF SNOW REMOVAL EQUIPMENT IS NOT HIGHLY EFFICIENT AND ABSOLUTELY NECESSARY FOR WINTER ROAD MAINTENANCE. THE HEAVIER DISPLACEMENT PLOW AS WELL AS THE DIFFERENT TYPES OF ROTARIES ARE SURELY ESSENTIAL DURING EMERGENCY STORMS FOR CLEARING THE INITIAL CUTS AND ARE CONSIDERED INDISPENSABLE FOR WIDENING CUTS FORMERLY MADE WITH ANY TYPE OF PLOW WHATEVER AND ALSO FOR THE OPENING OF SUCH ROADS IN THE SPRING THAT WERE NOT DEEMED OF SUFFICIENT IMPORTANCE FOR INCLUSION IN THE REGULAR WINTER PROGRAM. THE HEAVIER TYPE OF EQUIPMENT AT THE PRESENT TIME CONSISTS OF LARGE "V" PLOWS EITHER TRACTOR MOUNTED OR TRACTOR HAULED, AND AT LEAST TWO TYPES OF ROTARY SNOW PLOWS. THESE TWO TYPES ARE DISTINGUISHED IN ONE INSTANCE BY THE FANS ROTATING PARALLEL WITH THE LINE OF TRAVEL, AND THE OTHER BY THE FANS ROTATING PERPENDICULARLY WITH THE AXIS OF THE ROAD. THE LATERAL TYPE DEPENDS UPON THE POWER FROM THE TRACTOR MOUNT TO ROTATE THE FANS, BUT THE FRONT TYPE CARRIES DOUBLE AUXILIARY MOTORS TO SUPPLY POWER FOR THE RESPECTIVE ROTORS.

C. S. JARVIS WINS THE J. JAMES R. CROES MEDAL

C. S. JARVIS, ASSOCIATE HIGHWAY ENGINEER OF THE BUREAU HAS BEEN AWARDED THE J. JAMES R. CROES MEDAL FOR HIS PAPER "FLOOD-FLOW CHARACTERISTICS," BY THE AMERICAN SOCIETY OF CIVIL ENGINEERS. THIS MEDAL IS CONSIDERED AS NEXT TO THE HIGHEST HONOR OF THIS CHARACTER CONFERRED BY THE SOCIETY AND IS AWARDED FOR A PAPER WHICH IS JUDGED WORTHY OF SPECIAL COMMENDATION FOR ITS MERIT AS A CONTRIBUTION TO ENGINEERING SCIENCE.

MR. JARVIS HAS FOR SEVERAL YEARS MADE A SPECIAL STUDY OF FLOOD FLOW IN STREAMS IN ADDITION TO HIS REGULAR HIGHWAY ENGINEERING DUTIES. HIS OBJECT HAS BEEN TO ARRIVE AT SOME METHOD WHEREBY THE MAXIMUM FLOOD FLOW OF A STREAM CAN BE DETERMINED WITH A FAIR DEGREE OF ACCURACY FROM SUCH INFORMATION AS CAN BE COLLECTED IN THE COURSE OF A SURVEY FOR A BRIDGE OR RIVER CONTROL WORK. SUCH INFORMATION IS PARTICULARLY VALUABLE TO THE HIGHWAY ENGINEER WHO MUST BUILD HIS STRUCTURES TO WITHSTAND THE GREATEST FLOODS.

THE PAPER BY MR. JARVIS, AFTER ITS SUBMISSION TO THE SOCIETY WAS HELD OPEN TO DISCUSSION FOR MORE THAN A YEAR AND WAS DISCUSSED BY LEADING AUTHORITIES ON THE SUBJECT.



FIGURE 7. A SECTION OF ROAD WITH CRUSTED SNOW ABOUT TO BE ATTACKED WITH A LATERAL TYPE OF ROTARY PLOW.



FIGURE 8. A ROTARY PLOW OPENING A PASS THROUGH THE SECTION OF ROAD SHOWN IN FIGURE 7.



FIGURE 9. A PRELIMINARY PASS CLEARED THROUGH THE SAME SECTION OF ROAD.

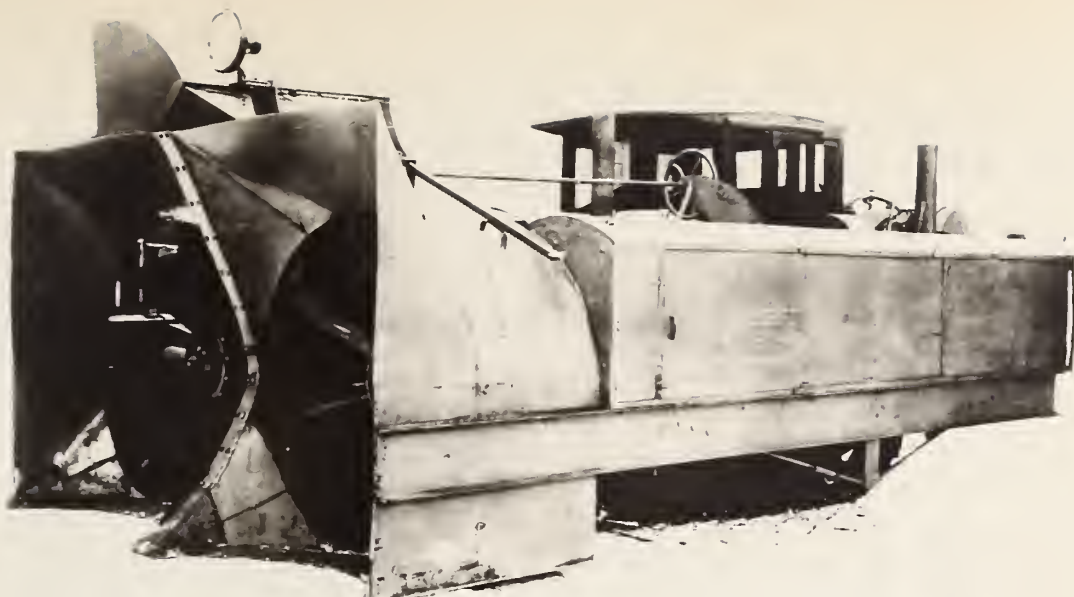


FIGURE 10. FRONT VIEW OF HEAVIER TYPE OF ROTARY SNOW PLOW.
THE FANS REVOLVE PERPENDICULARLY WITH THE AXIS
OF THE PLOW.

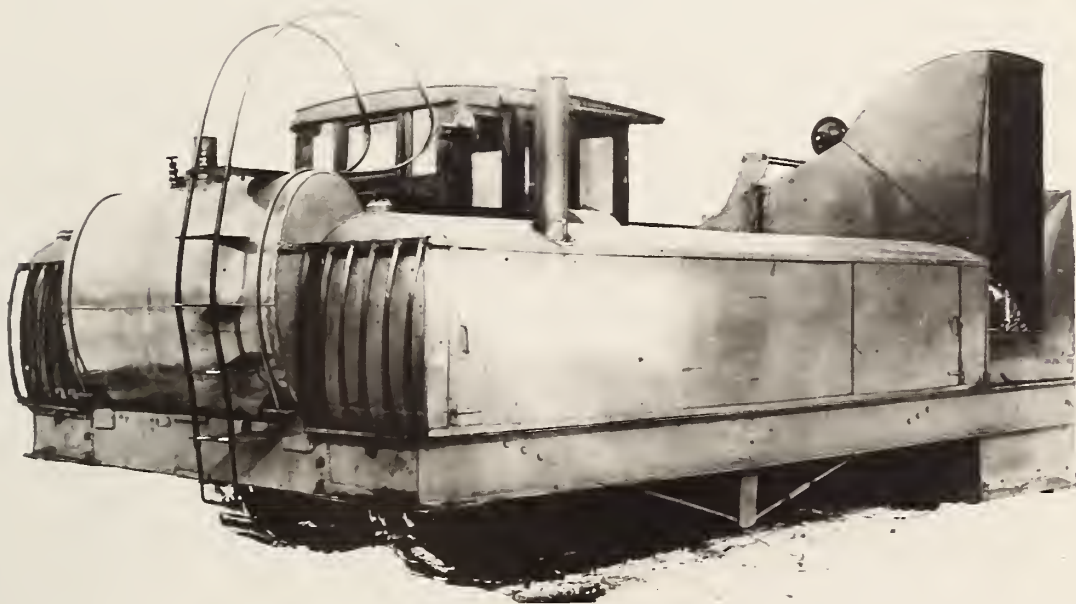


FIGURE 11. REAR VIEW OF THE HEAVIER TYPE OF ROTARY PLOW.



FIGURE 12. A ROADWAY CLEARED TO A GENEROUS WIDTH WITH
THE HEAVIER TYPE OF ROTARY PLOW.

STATUS OF FEDERAL AID ROAD CONSTRUCTION FUNDS

AS OF SEPTEMBER 30, 1936

D. P. R. - F. A. - A - 1
M - Ser. 1, 1936 - A

STATES	I APPORTIONMENT FROM JULY 1, 1916 TO DATE	2 ALLOTTED TO PROJECTS (SEE COLUMN 6 FOR DETAILS)		3 PLACED UNDER CONSTRUCTION		4 PAID TO STATES	5 BALANCE OF APPORTIONMENTS		6 ALLOTMENTS TO PROJECTS (SUBDIVISION OF AMOUNTS SHOWN IN COLUMN 2)						STATES	
		ALLOTTED		PLACED UNDER			APPORTIONMENTS		COMPLETED AND PAID	AGREEMENT STAGE		P. S. & E. STAGE RECOMMENDED BY DISTRICT ENGINEER				
		FEDERAL AID	MILES	FEDERAL AID	MILES		NOT ALLOTTED TO PROJECTS (COLUMN 1-2)	NOT YET PLACED UNDER CONSTRUCTION (COLUMN 1-3)		MILES	FEDERAL AID	MILES	FEDERAL AID	MILES		
ALABAMA	\$ 14,349,456.00	\$ 11,979,313.57	1645.9	\$ 11,127,212.23	1507.1	\$ 10,225,413.71	\$ 2,370,141.43	\$ 3,222,242.77	\$ 9,219,301.44	1374.0	\$ 1,966,385.81	131.4	\$ 895,026.32	140.5	ALABAMA	
ARIZONA	9,617,249.00	7,030,545.30	837.6	6,311,164.81	837.6	6,311,164.81	2,586,703.70	2,586,703.70	6,035,777.09	756.6	972,337.49	80.7	22,430.72	0.3	ARIZONA	
ARKANSAS	11,605,804.00	10,599,602.48	1735.9	9,977,952.39	1641.7	9,469,160.27	1,006,001.52	1,627,851.02	7,925,097.47	1361.8	2,062,955.51	279.9	621,949.50	94.2	ARKANSAS	
CALIFORNIA	22,072,815.00	19,433,719.72	1404.3	19,039,522.28	1388.3	16,810,524.10	2,639,095.28	2,973,292.72	14,019,773.02	1139.6	4,763,262.40	231.8	650,694.30	32.9	CALIFORNIA	
COLORADO	12,325,912.00	10,273,262.80	1033.4	10,049,308.46	1006.5	8,432,290.00	2,052,549.20	2,236,503.54	7,509,435.00	770.5	1,946,746.72	197.6	917,081.08	65.3	COLORADO	
CONNECTICUT	4,333,691.00	3,590,012.04	188.1	3,364,616.83	177.4	2,376,669.89	743,668.96	969,062.17	2,237,687.92	123.9	1,001,362.91	50.9	351,061.21	13.3	CONNECTICUT	
DELAWARE	2,474,059.00	2,463,262.15	168.0	2,391,556.60	159.7	2,057,540.36	10,795.85	92,501.40	2,057,540.35	141.8	334,016.25	17.9	71,705.55	8.3	DELAWARE	
FLORIDA	8,094,964.00	6,739,455.39	422.7	6,467,661.44	412.6	5,259,346.44	1,285,468.61	1,617,282.56	2,313,425.61	164.8	4,154,235.83	247.8	331,803.95	10.1	FLORIDA	
GEORGIA	18,431,953.00	18,390,982.59	2470.6	18,240,845.91	2457.8	16,229,744.89	41,060.41	91,107.19	12,426,001.26	1985.3	5,564,210.91	574.2	400,690.42	11.1	GEORGIA	
IDAHO	8,559,627.00	8,250,455.36	971.7	7,926,615.70	904.3	6,990,718.74	209,171.64	733,011.30	6,052,491.77	738.0	1,270,263.02	145.9	1,027,700.57	37.8	IDAHO	
ILLINOIS	29,932,198.00	26,105,115.41	1775.7	25,407,135.34	1729.5	22,759,187.46	3,727,082.59	4,362,062.08	21,600,956.40	1084.8	1,547,178.62	108.0	2,956,980.39	221.9	ILLINOIS	
INDIANA	19,204,355.00	17,387,329.88	1101.3	17,334,572.30	1100.9	14,412,384.23	917,025.12	969,792.10	9,194,174.01	599.5	7,752,527.91	469.5	440,627.96	32.3	INDIANA	
IOWA	19,485,563.00	19,205,102.41	2992.6	18,235,236.18	2914.3	14,677,752.03	280,460.59	1,250,326.92	12,603,522.07	2200.4	5,574,561.69	739.1	1,026,918.65	54.1	IOWA	
KANSAS	19,464,411.00	18,956,641.16	2047.6	17,998,599.07	1912.7	15,341,590.72	607,969.85	1,577,811.93	12,826,397.60	1209.5	4,760,730.45	695.3	1,259,423.10	152.8	KANSAS	
KENTUCKY	13,212,809.00	12,474,113.50	1168.5	12,256,615.78	1137.3	10,266,335.64	739,695.50	966,293.22	9,598,469.08	761.6	2,654,112.99	281.6	1,221,531.43	112.3	KENTUCKY	
LOUISIANA	9,272,408.00	8,720,146.92	1302.0	8,202,396.52	1263.2	7,292,713.29	552,261.08	1,070,011.48	6,192,633.25	1065.9	1,831,566.16	168.6	695,942.51	67.5	LOUISIANA	
MAINE	6,464,828.00	5,737,418.63	426.6	5,260,497.41	398.6	4,729,629.16	727,409.37	1,204,330.59	4,309,976.38	315.2	1,342,146.75	105.7	86,295.00	5.7	MAINE	
MARYLAND	5,325,057.00	5,925,055.51	511.6	5,754,514.79	495.5	5,146,096.97	1,49	170,542.21	5,112,991.22	423.3	762,304.29	94.1	49,760.00	4.2	MARYLAND	
MASSACHUSETTS	10,109,726.00	8,276,521.49	459.9	8,077,613.32	448.0	6,816,838.67	1,932,204.51	2,031,112.69	6,679,970.67	374.7	1,405,860.44	72.9	190,690.38	12.3	MASSACHUSETTS	
MICHIGAN	20,342,365.00	19,263,416.46	1360.0	18,101,943.77	1355.3	15,728,594.71	2,038,948.54	2,240,421.23	12,015,763.34	976.6	5,323,110.17	314.6	914,536.95	69.8	MICHIGAN	
MINNESOTA	19,591,780.00	19,446,975.63	3789.3	19,440,375.63	3773.1	18,497,695.50	144,904.37	150,404.37	16,716,275.63	3410.5	2,651,700.00	373.7	79,000.00	5.1	MINNESOTA	
MISSISSIPPI	12,129,018.00	11,792,818.13	1604.6	11,509,004.03	1556.2	9,577,524.68	335,199.87	619,013.97	7,791,804.75	1174.3	3,066,633.74	338.5	934,379.64	91.8	MISSISSIPPI	
MISSOURI	22,786,436.00	22,680,896.32	2142.4	22,289,860.62	2129.0	18,181,462.23	205,649.68	496,575.38	15,577,232.84	1667.0	6,524,605.86	453.6	479,047.63	21.8	MISSOURI	
MONTANA	13,424,885.00	8,969,494.34	1372.3	8,492,664.84	1270.3	7,217,323.72	4,455,396.66	4,932,220.16	6,532,033.92	1103.8	2,297,656.30	266.1	79,799.12	12.4	MONTANA	
NEBRASKA	14,635,235.00	12,938,939.46	3352.1	12,580,020.35	3292.9	9,578,911.28	1,796,395.54	2,055,214.65	5,765,777.61	1334.0	6,374,217.17	134.3	698,844.69	174.9	NEBRASKA	
NEVADA	9,795,215.00	9,345,071.34	948.9	9,313,225.08	944.0	7,647,405.66	604,143.66	653,989.92	6,153,703.28	653.8	1,699,287.54	231.4	452,080.42	63.7	NEVADA	
NEW HAMPSHIRE	3,169,492.00	3,053,315.44	280.5	3,019,056.50	279.4	2,522,695.71	116,176.55	161,435.50	2,377,450.07	237.6	600,110.66	36.6	75,754.71	6.3	NEW HAMPSHIRE	
NEW JERSEY	8,467,420.00	8,320,852.25	367.6	8,021,937.25	347.7	6,913,256.85	146,567.76	445,532.75	5,300,396.41	303.6	2,659,431.67	41.2	361,024.17	22.8	NEW JERSEY	
NEW MEXICO	10,972,386.00	9,267,868.14	1651.7	8,927,822.43	1598.2	7,874,860.33	1,704,567.96	2,044,563.51	7,319,637.38	1427.0	997,074.22	110.5	991,136.54	114.2	NEW MEXICO	
NEW YORK	34,045,195.00	30,270,159.57	1975.2	29,182,803.57	1946.1	22,162,029.32	3,775,036.43	5,962,391.43	18,588,353.37	1239.0	10,994,005.20	691.9	697,600.00	44.3	NEW YORK	
NORTH CAROLINA	15,717,206.00	16,308,763.41	1504.3	14,852,574.31	1463.9	13,497,176.52	408,442.59	864,631.69	12,590,229.71	1331.2	2,108,389.85	123.0	610,144.85	50.1	NORTH CAROLINA	
NORTH DAKOTA	10,749,659.00	10,690,403.29	3377.1	10,142,475.40	3229.2	7,557,937.77	67,955.71	606,193.60	6,501,399.07	2295.7	3,067,721.60	834.2	1,111,692.62	247.2	NORTH DAKOTA	
OHIO	25,731,795.00	23,697,459.69	1855.5	22,767,216.91	1783.9	20,013,616.00	2,034,336.40	2,964,579.19	17,926,138.90	1413.6	4,106,146.74	317.4	1,665,173.96	124.5	OHIO	
OKLAHOMA	16,059,787.00	15,465,603.44	1438.2	14,620,261.32	1306.3	14,100,450.99	594,183.56	1,439,526.68	13,491,290.30	1206.6	1,025,103.62	128.9	949,209.52	102.7	OKLAHOMA	
OREGON	10,379,347.00	10,771,612.57	1050.9	10,632,194.66	1083.5	9,962,319.15	107,734.43	247,152.24	9,996,855.71	962.9	1,608,543.78	111.6	168,213.08	16.4	OREGON	
PENNSYLVANIA	31,339,781.00	30,231,941.61	1795.6	29,777,132.45	1767.5	26,355,551.47	1,106,839.39	1,561,648.65	21,560,732.04	1189.8	8,110,942.09	581.5	560,367.48	25.2	PENNSYLVANIA	
RHODE ISLAND	2,667,659.00	2,187,179.06	128.6	1,965,994.06	115.2	1,645,004.06	480,399.94	681,594.94	1,645,004.06	92.4	465,345.00	31.1	76,930.00	5.1	RHODE ISLAND	
SOUTH CAROLINA	9,601,824.00	9,759,110.49	1744.6	9,702,166.91	1731.2	8,740,794.85	43,413.51	99,335.09	7,028,910.34	1626.1	2,592,753.57	196.1	136,446.68	22.4	SOUTH CAROLINA	
SOUTH DAKOTA	11,166,750.00	10,975,369.22	2998.6	10,935,624.78	2994.5	9,869,933.45	191,460.78	231,165.22	9,893,704.19	2308.3	1,856,586.13	643.2	225,068.90	47.1	SOUTH DAKOTA	
TENNESSEE	15,280,591.00	14,586,635.49	1052.9	14,400,664.40	1044.9	12,873,695.63	594,056.61	879,926.60	10,630,327.89	801.2	3,687,436.29	246.9	268,771.31	4.7	TENNESSEE	
TEXAS	40,606,431.00	37,428,378.73	5337.4	36,933,866.82	6890.0	32,691,811.19	3,178,562.27	4,672,574.18	28,379,877.22	5085.4	7,165,594.83	754.2	1,982,896.68	97.8	TEXAS	
UTAH	7,815,779.00	7,265,256.63	775.6	6,569,984.26	725.9	6,180,444.31	533,522.37	1,249,794.74	5,151,726.55	555.5	1,417,269.71	170.4	656,272.37	49.7	UTAH	
VERMONT	3,268,597.00	2,861,659.74	174.5	2,936,745.09	173.7	2,296,296.83	406,947.26	431,761.91	2,017,699.51	134.5	803,093.56	39.0	40,965.67	1.0	VERMONT	
VIRGINIA	13,531,514.00	13,386,134.85	1207.1	13,358,494.52	1206.8	12,517,651.51	116,379.15	625,624.05	10,745,096.61	1034.4	2,481,360.96	167.8	158,677.28	15.5	VIRGINIA	
WASHINGTON	10,145,176.00	9,594,151.95	760.1	9,520,151.95	716.4	8,517,710.98	261,624.05	625,624.05	7,894,551.96	672.9	2,004,600.00	97.2				

THE SECOND ALL-WESTERN ROAD SHOW

THE SECOND ALL-WESTERN ROAD SHOW WAS HELD FROM NOVEMBER 7 TO 15, 1926, ON THE GROUNDS OF THE MARINA IN SAN FRANCISCO - THE SITE OF THE SAN FRANCISCO EXPOSITION. THE RESULTS OF THE SHOW MORE THAN JUSTIFIED THE EXPECTATIONS OF THE PROMOTERS. THE REGISTERED VISITORS NUMBERED 11,000 - MORE THAN TWICE THAT OF LAST YEAR - AND THE AMOUNT OF ROAD BUILDING EQUIPMENT AND MACHINERY SOLD WAS SAID TO BE FAR IN EXCESS OF THE PREVIOUS DISPLAY. ONE OF THE INTERESTING FEATURES OF THE REGISTRATION WAS THE NUMBER OF FOREIGN VISITORS IN ATTENDANCE, THERE BEING PRESENT REPRESENTATIVES FROM ENGLAND, GERMANY, SOUTH AFRICA, SOUTH AMERICA, JAPAN, AUSTRALIA, HAWAII, CANADA AND OTHER DISTANT LOCALITIES.

THE EXHIBIT OF THE BUREAU WAS LOCATED ON BOTH SIDES OF THE WOODEN SHED WHICH LED FROM THE MAIN ENTRANCE TO THE PRINCIPAL EXHIBITION TENT. THE DISPLAY CONSISTED OF FLEXIBLE AND STANDARD BOOTHS ILLUSTRATING THE FOLLOWING SUBJECTS:

FEDERAL-AID ROAD BUILDING, FINANCING TRUNK ROADS, HIGHWAY EXPENDITURES, SUBGRADE SOILS, EFFICIENT CONCRETE MIXING, THE FEDERAL-AID HIGHWAY SYSTEM, RAILROAD VERSUS MOTOR TRANSPORT, MILK TRANSPORTATION, UNITED STATES HIGHWAYS SIGNS, TRAFFIC REGULATION, HIGHWAY ACCIDENTS, AND CRUSHED ROCK AND GRAVEL SURFACING. THESE EXHIBITS WERE SO LOCATED BY THE MANAGEMENT OF THE SHOW THAT IT WAS NECESSARY FOR ALL VISITORS TO PASS THEM AS THEY ENTERED THE MAIN ENCLOSURE.

FROM AN ENGINEERING STANDPOINT THE SCHEDULED MEETING OF THE WESTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS AT 10:00 A.M. ON MONDAY, OCTOBER 11, WAS OF PRIME INTEREST. STATE HIGHWAY ENGINEER BORDEN OF NEVADA PRESIDED AND OPENED THE DISCUSSION WITH A PAPER OUTLINING THE NECESSITY FOR THE IMPROVEMENT OR MAINTENANCE OF THE LARGE MILEAGE OF SECONDARY ROADS IN THE WESTERN STATES IN ORDER THAT THE TRAFFIC MIGHT REACH AND SO HAVE AN OPPORTUNITY TO USE THE MORE HIGHLY IMPROVED TRUNK ROADS. IN ORDER TO ACCOMPLISH THIS OBJECTIVE HE ADVOCATED THE DEVELOPMENT OF SOME INEXPENSIVE FORM OF SURFACING WHICH WOULD MAKE USABLE THE GREATEST MILEAGE OF THESE FEEDER ROADS. HE INTRODUCED DR. HEWES OF THE BUREAU WHO DELIVERED AN INTERESTING PAPER ON THE DEVELOPMENT OF THE PENETRATION MACADAM SURFACING FROM ITS INCEPTION TO THE PRESENT TIME. THE MASSACHUSETTS TYPE WAS REFERRED TO AS A RECOGNIZED SUCCESS.

MR. BALDOCK, MAINTENANCE ENGINEER OF THE OREGON STATE HIGHWAY DEPARTMENT FOLLOWED WITH A PAPER ON THE METHODS OF OILING CRUSHED ROCK AND GRAVEL ROADS THAT HAVE BEEN PRACTICED IN OREGON FOR SOME TWO OR THREE YEARS. THE LIGHT ROAD OIL IS USED AS A DUST PALLIATIVE AND TO PREVENT THE DISINTEGRATION, WEAR, AND SCATTERING OF THE CRUSHED ROCK AND GRAVEL SURFACING BY TRAFFIC. MR. BALDOCK STATED THAT THE ANNUAL SAVINGS IN MAINTENANCE ON THE OIL-TREATED ROADS AS COMPARED WITH THE MAINTAINED BUT UNTREATED CRUSHED ROCK AND GRAVEL ROADS AMOUNTED TO 20 PER CENT. SINCE THE OBSERVATIONS HAD BEEN MADE ONLY OVER A PERIOD OF THREE YEARS HE BELIEVED IT WAS TOO EARLY YET TO PLACE MUCH RELIANCE IN COMPARATIVE COST DATA. HE CALLED ATTENTION TO THE INCONVENIENCE TO TRAFFIC CAUSED BY AUTOMOBILES RUNNING OVER THE OILED SURFACE DURING CONSTRUCTION BEFORE THE SCREENINGS HAD BEEN SPREAD. BY MORE CAREFUL TRAFFIC CONTROL AND CONSTRUCTION, HOWEVER, HE SAID THIS INCONVENIENCE TO TRAFFIC WAS BEING REDUCED CONSIDERABLY.

DR. HEWE'S AND MR. BALDOCK'S PAPERS WERE DISCUSSED BY C. L. MCKESSON, MATERIALS AND RESEARCH ENGINEER OF THE CALIFORNIA STATE HIGHWAY DEPARTMENT AND OTHERS. THE LIGHT OIL TREATMENT HAS BEEN USED CONSIDERABLY IN THAT STATE IN THE LAST YEAR OR SO AND AFTER AN INVESTIGATION OF A NUMBER OF ROADS MR. MCKESSON BELIEVES IT WILL BE SUCCESSFUL FOR MAINTAINING THE EXISTING CRUSHED ROCK AND GRAVEL ROADS. THE BUREAU IN COOPERATION WITH THE CALIFORNIA STATE HIGHWAY DEPARTMENT IS NOW MAKING A COOPERATIVE STUDY OF THE OILED TREATMENT OF CRUSHED ROCK AND GRAVEL ROADS IN THE PACIFIC COAST STATES.

THE INCOME AND DISBURSEMENTS OF THE STATE HIGHWAY DEPARTMENTS FOR 1925

THE TOTAL EXPENDITURE BY THE STATE HIGHWAY DEPARTMENTS IN 1925 FOR ROAD AND BRIDGE CONSTRUCTION ON THE SEVERAL STATE HIGHWAY SYSTEMS AMOUNTED TO \$649,125,101, ACCORDING TO REPORTS FROM THE HIGHWAY DEPARTMENTS JUST COMPILED BY THE BUREAU. OF THE TOTAL EXPENDITURE 59.6 PER CENT WAS SPENT FOR ROAD AND BRIDGE CONSTRUCTION, 18.4 PER CENT FOR MAINTENANCE, AND 3.5 PER CENT FOR MATERIALS AND EQUIPMENT. ADMINISTRATIVE AND ENGINEERING COSTS ACCOUNTED FOR 4.7 PER CENT OF THE TOTAL, INTEREST AND PRINCIPLE PAYMENTS ON BONDS 7.8 PER CENT, AND MISCELLANEOUS EXPENDITURES AMOUNTED TO 6.0 PER CENT OF THE TOTAL.

TO MEET THESE EXPENSES THE HIGHWAY DEPARTMENTS RECEIVED FROM VARIOUS SOURCES DURING THE YEAR A TOTAL INCOME OF \$780,081,292 OF WHICH \$115,656,721 WAS AVAILABLE AS A BALANCE FROM THE PREVIOUS YEAR'S OPERATIONS, SO THAT THE AMOUNT OF MONEY RAISED DURING THE YEAR WAS ONLY \$664,425,571. OF THE LATTER AMOUNT 43.5 PER CENT WAS RAISED BY MEANS OF MOTOR VEHICLE LICENSE FEES AND GASOLINE TAXES, 30 PER CENT FROM THE FORMER AND THE BALANCE FROM THE LATTER. THE SALE OF BONDS REALIZED 21.3 PER CENT OF THE TOTAL FOR THE YEAR, AND FEDERAL AID RECEIVED FROM THE NATIONAL GOVERNMENT AMOUNTED TO 13.9 PER CENT. FUNDS TRANSFERRED TO THE STATE BY THE COUNTIES AND OTHER LOCAL GOVERNMENTS AMOUNTED TO 10.8 PER CENT, AND THE BALANCE WAS MADE UP OF FUNDS DERIVED FROM SPECIAL HIGHWAY TAXES AND APPROPRIATIONS AND FROM MISCELLANEOUS SOURCES AS FOLLOWS: TAXES, 3.3 PER CENT; APPROPRIATIONS, 5.0 PER CENT; AND MISCELLANEOUS 2.2 PER CENT.

ALTHOUGH THE YEAR'S EXPENDITURES WERE SLIGHTLY GREATER THAN THE PREVIOUS YEAR'S TOTAL OF \$605,665,207, THE BALANCE OF \$130,956,191 CARRIED OVER INTO THE CURRENT YEAR WAS EVEN GREATER THAN THE AMOUNT OF UNEXPENDED FUNDS CARRIED OVER FROM 1924. THE RATE OF CONSTRUCTION REMAINED ABOUT THE SAME AS IN PREVIOUS YEARS.

ONE OF THE MOST SIGNIFICANT FACTS BROUGHT OUT BY THE REPORT IS THE REMARKABLE INCREASE IN THE PERCENTAGE OF THE TOTAL HIGHWAY INCOME DERIVED FROM MOTOR VEHICLE AND GASOLINE TAXES, AND THE FALLING OFF IN THE PERCENTAGE REPRESENTING REAL AND PERSONAL PROPERTY TAXATION. THERE HAS BEEN A STEADY TENDENCY IN THIS DIRECTION SINCE 1921. IN THAT YEAR THE COMBINED INCOME FROM MOTOR VEHICLE LICENSES AND GASOLINE TAXES AMOUNTED TO 25.9 PER CENT, THE GAS TAX REVENUE AMOUNTING TO LESS THAN ONE PER CENT. IN 1925 THE INCOME PRODUCED FROM THESE SOURCES WAS 43.5 PER CENT OF THE YEAR'S TOTAL AND THE GAS TAXES ALONE AMOUNTED TO 13.5 PER CENT.

IN THE SAME PERIOD TAXES ON PROPERTY SPECIFICALLY FOR ROAD PURPOSES HAVE DROPPED FROM 11.2 PER CENT TO 3.3 PER CENT OF THE YEAR'S TOTAL INCOME. INCLUDING THE INCOME FROM APPROPRIATIONS AND MISCELLANEOUS SOURCES, MOST OF WHICH IS RAISED INDIRECTLY BY PROPERTY TAXATION, THE 1921 PERCENTAGE WAS 20.7 AND THE 1925 PERCENTAGE WAS 10.5.

FUNDS RAISED BY THE SALE OF BONDS WERE ALSO A SMALLER PERCENTAGE OF THE TOTAL IN 1925 THAN IN 1921, BEING 21.3 PER CENT IN 1925 AS COMPARED WITH 27.8 IN 1921.

EXTRACT FROM GOOD ROADS, THE BRITISH ROAD BUILDING MAGAZINE.
FROM AN ARTICLE ON "SURFACE WATER AND SUBSOIL DRAINAGE" BY
HAROLD BRADLEY, DEPUTY COUNTY SURVEYOR OF WORCESTERSHIRE.

"A COMPARATIVELY LARGE EXPENDITURE HAS BEEN INCURRED IN THIS COUNTRY BY CONDUCTING TESTS ON MATERIALS USED FOR ROAD-MAKING AND EXAMINING THEIR ABILITIES TO WITHSTAND MODERN TRAFFIC. THIS RESEARCH WORK HAS BEEN OF INCALCULABLE VALUE TO THE HIGHWAY ENGINEER, BUT IT IS TO BE REGRETTED THAT THE STUDY OF SUBSOILS AND THEIR BEHAVIOUR UNDER CLIMATIC CONDITIONS, HAS NOT BEEN GIVEN THE PROMINENCE THE SUBJECT WARRANTS. THE UNITED STATES BUREAU OF PUBLIC ROADS HAS WON WORLD-WIDE RECOGNITION BY THE EXTREMELY ABLE AND PAINSTAKING MANNER, IN WHICH IT HAS COLLECTED THE MOST INTERESTING DATA CONCERNING SUBSOILS. THE INFORMATION GAINED HAS BEEN OBTAINED BY FIELD, AS WELL AS LABORATORY RESEARCH, AND MUCH USEFUL KNOWLEDGE CAN BE ACQUIRED BY PERUSING THE REPORTS AND EXPERIMENTING ON THE LINES SUGGESTED BY AMERICAN ENGINEERS."

* * * * *

"IN CONCLUSION, THE NATURE OF THE SUBSOIL SHOULD ALWAYS DETERMINE THE DESIGN OF THE ROAD, THE EFFECTIVENESS OF THE SUBSOIL BEING DEPENDENT ON THE DRAINAGE. THE PROBLEM IS TO DECIDE ON THE MOST ECONOMICAL TYPE TO BE ADOPTED, AND THIS CAN ONLY BE SOLVED BY INDIVIDUAL STUDY OF THE LOCATION. BUT, IF WE BUILD FOR POSTERITY, THE PERMANENCE OF OUR ROADS MUST DEPEND ON THE FOUNDATION AND THE ROAD-BED CARRYING THEM. BUILD RIGHT FROM THE BOTTOM AND THE TOP WILL TAKE CARE OF ITSELF."

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

F-1 (1925)
R. S. A.

TOTAL INCOME AND FUNDS AVAILABLE.
FOR STATE ROAD AND BRIDGE WORK UNDER SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS.
DURING FISCAL YEAR 1925. (1)

STATES	FISCAL YEAR ENDS	TOTAL FUNDS AVAILABLE 1925	BALANCE AT BEGINNING OF YEAR	TOTAL INCOME DURING YEAR	TOTAL FUNDS	% OF TOTAL FUNDS	STATE TAX LEVIED FOR HIGHWAYS, ETC.	% OF TOTAL FUNDS	APPROPRIATIONS BY STATE FOR HIGHWAYS	% OF TOTAL FUNDS	MISCELLANEOUS STATE INCOME FOR HIGHWAYS	% OF TOTAL FUNDS	MOTOR VEHICLE FEES, ETC. FOR ROAD PURPOSES	% OF TOTAL FUNDS	GASOLINE TAX APPLICABLE TO HIGHWAYS	% OF TOTAL FUNDS	TRANSFERRED FUNDS FROM COUNTIES, ETC.	% OF TOTAL FUNDS	FEDERAL AID POST ROAD FUNDS USED	% OF TOTAL FUNDS
ALABAMA	9/30	\$ 13,436,949	\$ 2,006,677	\$ 11,431,292	86.1	50.7	-	-	-	-	\$ 40,577	0.3	\$ 1,008,722	14.2	(2)	-	\$ 351,214	2.6	2,330,779	17.3
ALABAMA	12/31	2,976,481	2,006,677	2,976,481	76.2	-	\$ 640,896	0.3	\$ 9,250	0.3	37,933	1.3	403,667	13.6	416,924	14.1	46,500	1.5	705,729	23.9
ARKANSAS	12/31	11,200,000	550,000	10,650,000	95.1	-	-	-	-	-	-	-	3,150,000	28.1	3,150,000	31.3	2,150,000	19.3	1,840,000	14.4
CALIFORNIA	12/31	23,325,776	5,950,362	17,375,414	75.6	-	-	-	4,087,309	17.6	159,329	2.3	3,271,098	18.0	6,863,946	29.4	438,338	2.1	2,856,723	12.4
COLORADO	6/30	7,017,070	1,680,834	5,336,236	75.9	14.9	1,033,328	14.7	-	-	-	-	917,452	9.3	917,452	13.1	75,144	1.1	1,443,455	20.5
CONNECTICUT	6/30	18,564,610	7,561,733	11,002,877	59.3	-	-	-	2,100,750	11.3	(4) 881,494	4.8	5,982,071	30.1	1,130,226	6.1	424,037	2.3	870,239	4.7
DELAWARE	12/31	3,923,754	744,315	3,179,439	31.0	25.1	-	-	-	-	-	-	680,010	17.3	342,081	8.7	747,754	15.1	354,078	9.0
FLORIDA	12/31	10,910,502	547,323	10,363,179	95.0	-	505,010	4.6	-	-	(5) 270,908	2.4	2,471,459	22.6	4,355,635	40.0	1,699,956	15.5	1,080,574	9.9
GEORGIA	12/31	9,131,034	803,376	8,327,658	91.2	-	-	-	-	-	30,734	0.3	2,876,368	31.5	1,404,139	15.4	1,355,711	15.2	2,530,757	23.8
IDAHO	12/31	3,831,111	342,302	3,488,809	91.1	(3) 163,500	4.3	401,730	10.5	-	27,989	0.7	135,833	3.6	895,444	23.4	721,522	18.8	2,171,924	25.8
ILLINOIS	12/31	41,212,007	1,356,245	39,855,762	96.6	57.1	-	-	-	-	514,261	1.2	13,050,977	31.7	(10)	-	-	-	2,171,924	5.3
INDIANA	9/30	15,870,407	1,991,695	13,878,712	37.5	-	554,996	6.0	-	-	553,150	3.5	4,101,338	25.8	(11) 220,970	26.6	437,946	2.8	1,162,412	22.8
IOWA	12/31	17,393,710	2,271,351	15,122,359	87.3	-	-	-	40,450	0.5	-	-	9,068,126	50.5	799,144	4.6	2,270,233	23.9	1,261,956	7.0
KANSAS	12/31	11,121,338	2,443,940	8,677,398	77.7	-	783,312	7.1	-	-	77,271	0.6	3,284,749	29.5	2,905,194	26.1	2,213,300	20.0	1,840,000	15.7
KENTUCKY	6/30	10,112,191	(14) deficit	11,083,433	100.0	-	-	-	-	-	-	-	3,695,795	32.5	2,550,750	23.1	-	-	1,840,000	15.7
LOUISIANA	12/31	9,173,364	613,863	8,559,501	93.6	-	-	-	-	-	77,271	0.6	3,284,749	29.5	2,905,194	26.1	2,213,300	20.0	1,840,000	15.7
MAINE	12/31	8,464,707	1,204,774	7,259,933	85.8	-	700,439	8.3	-	-	60,132	0.6	3,284,749	29.5	2,905,194	26.1	2,213,300	20.0	1,840,000	15.7
MARYLAND	9/30	13,621,058	2,150,416	11,470,642	84.3	-	3,240,447	23.3	-	-	453,443	3.6	2,173,106	25.7	1,203,199	14.2	1,203,199	14.2	319,824	3.8
MASSACHUSETTS	12/31	14,229,556	1,643,245	12,586,311	88.7	-	-	-	766,226	5.2	-	-	1,912,593	14.0	1,529,297	11.2	1,177,674	8.5	752,573	5.8
MICHIGAN	6/30	33,552,640	3,946,882	29,605,758	90.0	-	-	-	-	-	698	-	13,077,305	33.9	2,300,895	6.0	4,967,523	12.9	3,608,417	9.3
MINNESOTA	12/31	22,033,334	2,773,474	19,259,860	87.4	-	1,965,880	8.9	-	-	600,500	2.7	9,751,028	44.1	3,068,205	13.9	-	-	2,081,992	9.4
MISSISSIPPI	12/31	5,354,551	1,630,483	3,724,068	71.4	-	-	-	-	-	78,538	1.3	93,812	1.6	1,189,276	20.2	1,170,756	20.1	1,170,756	20.1
MISSOURI	12/31	35,455,401	4,537,036	30,918,365	87.4	42.3	-	-	-	-	687,156	1.6	7,267,068	20.3	4,234,070	11.8	-	-	4,038,634	11.4
MONTANA	12/31	1,351,379	242,233	1,109,146	82.6	-	(16) 25,954	2.2	-	-	28,361	2.0	-	-	98,104	7.0	234,687	16.9	757,990	54.8
NEBRASKA	6/30	7,654,182	431,543	7,222,639	94.4	-	-	-	791,563	10.3	-	-	1,054,063	13.9	3,134,945	40.9	339,713	4.4	1,907,455	25.0
NEVADA	11/30	2,504,615	743,412	1,761,203	70.3	3.4	120,154	4.1	-	-	153,216	5.2	1,054,063	13.9	3,134,945	40.9	339,713	4.4	1,907,455	25.0
NEW HAMPSHIRE	12/31	5,047,150	743,412	4,303,738	85.2	-	-	-	-	-	96,128	1.9	1,054,063	13.9	3,134,945	40.9	339,713	4.4	1,907,455	25.0
NEW JERSEY	12/31	32,371,972	6,840,651	25,531,321	78.9	24.7	2,736,970	14.7	-	-	3,953	0.5	9,672,506	29.8	1,441,159	4.9	501,133	1.7	1,735,954	58.9
NEW MEXICO	12/31	3,814,350	20,086	3,794,264	99.5	-	873,275	22.9	-	-	19,538	0.5	2,492,436	7.4	1,441,159	4.9	501,133	1.7	1,735,954	58.9
NEW YORK	12/31	11,321,323	27,311,323	48,632,646	64.2	1.8	-	-	18,830,550	24.7	2,476,712	3.4	14,450,000	12.4	1,441,159	4.9	501,133	1.7	1,735,954	58.9
NORTH CAROLINA	6/30	34,252,506	91,567	34,344,073	99.7	-	-	-	-	-	3,797,752	11.1	18,473,075	53.5	(17) 239,607	15.3	763,562	2.3	1,036,012	3.0
NORTH DAKOTA	6/30	1,854,920	34,959	1,819,961	82.1	-	-	-	1,770,236	8.1	25,443	1.4	374,200	20.0	3,106,109	10.6	3,999,570	30.6	2,687,773	20.2
NORTH DAKOTA	12/31	29,354,472	4,433,435	24,921,037	83.5	-	-	-	3,777,035	12.9	1,921	-	5,943,920	20.2	3,106,109	10.6	3,999,570	30.6	2,687,773	20.2
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.7
ALABAMA	12/31	15,133,046	4,727,451	10,405,595	68.8	-	-	-	-	-	241,894	1.6	1,373,853	1.2	3,543,239	23.7	3,043,104	20.4	3,304,120	21.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

TOTAL DISBURSEMENTS

FOR STATE ROAD AND BRIDGE WORK UNDER SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS,
INCLUDING STATE BOND PAYMENTS, DURING FISCAL YEAR 1925. (1)

F-2 (1925)
R. S. A.

STATES	FISCAL YEAR ENDS	TOTAL DISBURSEMENTS DURING YEAR (100%)	CONSTRUCTION ON ROADS AND BRIDGES	% OF TOTAL DISBURSEMENTS	MAINTENANCE ON ROADS AND BRIDGES	% OF TOTAL DISBURSEMENTS	ADMINISTRATION AND ENGINEERING	% OF TOTAL DISBURSEMENTS	BONDS, NOTES ETC. PAYMENTS ON INTEREST	% OF TOTAL DISBURSEMENTS	EQUIPMENT, MACHINERY, MATERIALS	% OF TOTAL DISBURSEMENTS	DISBURSEMENTS ON TRAFFIC, ETC.	% OF TOTAL DISBURSEMENTS	MISCELLANEOUS EXPENSES	% OF TOTAL DISBURSEMENTS	UNEXPENDED BALANCE AT THE END OF YEAR	STATES
ALABAMA	9/30	\$ 10,917,204	\$ 8,406,968	77.0	\$ 517,369	4.7	\$ 780,211	7.2	\$ 538,766	4.9	\$ 73,702	0.7	3.3	0.7	\$ -	126	\$ 2,519,746	ALABAMA
ARIZONA	12/31	2,442,947	1,458,333	59.7	618,517	25.3	286,047	11.7	-	-	80,000	3.3	3.3	-	-	-	533,934	ARIZONA
ARKANSAS	12/31	11,200,000	3,732,500	33.3	3,154,000	28.1	480,000	4.3	-	-	2,076,000	18.5	18.5	-	-	-	1,534,500	ARKANSAS
CALIFORNIA	12/31	18,080,728	9,133,303	50.5	3,554,001	19.6	1,435,598	7.9	3,172,783	17.6	19,533	0.1	0.1	0.1	-	-	6,235,048	CALIFORNIA
COLORADO	12/31	5,650,141	3,500,141	61.9	803,270	14.3	134,525	2.4	377,500	6.7	76,240	1.4	1.4	0.7	-	-	1,462,430	COLORADO
CONNECTICUT	6/30	8,611,936	3,714,177	43.2	3,352,149	39.4	347,794	4.0	-	-	694,148	8.1	8.1	5.3	-	-	9,952,474	CONNECTICUT
DELAWARE	12/31	3,492,341	2,541,476	73.1	112,115	3.2	73,377	2.1	358,420	10.2	139,376	4.0	4.0	4.1	-	-	430,917	DELAWARE
FLORIDA	12/31	8,481,762	6,341,071	74.8	1,495,426	17.6	507,930	6.0	-	-	357,746	4.2	4.2	2.5	-	-	2,427,150	FLORIDA
GEORGIA	12/31	7,502,423	4,551,048	60.7	1,801,639	24.0	959,710	12.7	-	-	-	-	-	-	-	-	1,223,456	GEORGIA
ILLINOIS	12/31	3,435,931	2,286,130	66.6	422,177	12.3	255,575	7.4	169,976	4.9	97,992	2.8	2.8	2.0	-	-	194,930	ILLINOIS
INDIANA	12/31	36,375,983	29,047,971	79.9	1,834,738	5.0	1,874,167	5.1	2,987,304	8.2	329,952	0.9	0.9	1.7	-	-	4,835,024	INDIANA
IOWA	9/30	14,517,784	9,254,245	63.7	3,643,487	25.1	551,301	3.8	-	-	952,815	6.6	6.6	0.8	-	-	1,351,613	IOWA
KANSAS	11/30	14,107,759	6,674,738	47.3	3,021,004	21.4	695,593	5.0	-	-	34,615	0.2	0.2	2.9	-	-	3,790,912	KANSAS
KENTUCKY	12/31	7,407,369	5,330,244	71.9	1,750,000	23.6	327,125	4.4	-	-	-	-	-	-	-	-	3,720,969	KENTUCKY
LOUISIANA	6/30	14,016,316	10,000,906	71.4	4,025,460	27.0	249,738	1.7	-	-	386,476	2.7	2.7	1.6	-	-	(F) Deficit	LOUISIANA
MAINE	12/31	8,410,724	5,563,343	66.1	2,133,484	24.8	363,809	4.3	26,140	0.3	261,597	3.1	3.1	0.9	-	-	1,007,740	MAINE
MARYLAND	12/31	12,024,701	7,107,390	59.1	1,634,878	13.6	240,079	2.0	433,740	3.6	-	-	-	3.2	-	-	1,375,318	MARYLAND
MASSACHUSETTS	9/30	12,380,700	5,157,929	41.7	3,304,144	27.1	202,261	1.7	2,252,947	18.2	200,002	1.6	1.6	-	-	-	1,617,177	MASSACHUSETTS
MICHIGAN	6/30	36,138,444	24,433,645	67.6	2,050,334	5.7	1,021,074	2.8	229,226	0.6	234,461	0.6	0.6	0.2	-	-	2,454,091	MICHIGAN
MINNESOTA	12/31	17,962,567	10,413,519	58.0	3,493,480	19.5	253,826	1.4	1,987,232	11.1	435,430	2.4	2.4	105	-	-	4,130,827	MINNESOTA
MISSISSIPPI	12/31	4,795,152	3,467,703	72.3	1,073,774	22.2	770,574	16.1	-	-	12,496	0.3	0.3	2.1	-	-	1,081,371	MISSISSIPPI
MISSOURI	12/31	31,461,937	25,078,203	79.7	1,627,247	5.2	1,654,699	5.3	966,376	3.1	15,011	0.0	0.0	3.2	-	-	4,272,464	MISSOURI
MONTANA	12/31	1,267,242	967,048	76.3	103,271	8.2	136,472	10.7	-	-	-	-	-	-	-	-	124,137	MONTANA
NEBRASKA	6/30	5,163,762	4,038,407	78.2	592,981	11.5	247,770	4.8	22,701	0.4	-	-	-	-	-	-	2,086,430	NEBRASKA
NEVADA	11/30	3,962,966	2,409,109	60.8	217,269	5.5	168,287	4.2	-	-	13,747	0.3	0.3	5.3	-	-	Deficit	NEVADA
NEW HAMPSHIRE	12/31	4,027,241	1,673,642	41.5	2,128,133	52.8	87,268	2.2	-	-	54,650	1.3	1.3	1.1	-	-	1,019,909	NEW HAMPSHIRE
NEW JERSEY	12/31	23,936,444	12,417,351	51.9	4,331,276	18.1	1,409,624	5.9	1,491,474	6.2	64,606	0.3	0.3	2.4	-	-	8,432,318	NEW JERSEY
NEW MEXICO	12/31	3,322,548	2,156,730	64.9	806,497	24.0	137,320	4.1	114,000	3.4	183,437	5.5	5.5	0.2	-	-	492,302	NEW MEXICO
NEW YORK	12/31	49,368,770	18,363,049	37.2	10,306,501	20.9	2,346,010	4.7	4,260,000	8.6	4,141,878	8.4	8.4	10.2	-	-	26,967,693	NEW YORK
NORTH CAROLINA	6/30	32,531,114	19,551,562	60.2	3,234,166	9.9	1,953,639	6.0	2,317,349	7.1	3,763,831	11.5	11.5	0.1	-	-	1,653,982	NORTH CAROLINA
NORTH DAKOTA	12/31	1,362,348	1,179,007	86.5	219,649	16.1	292,118	21.7	-	-	171,574	12.5	12.5	-	-	-	6,772	NORTH DAKOTA
OHIO	12/31	24,035,289	14,131,696	58.8	9,203,040	38.2	746,022	3.1	-	-	-	-	-	-	-	-	5,278,583	OHIO
OKLAHOMA	12/31	12,537,673	10,335,153	82.4	1,202,421	9.6	443,502	3.5	-	-	460,687	3.6	3.6	0.3	-	-	2,186,412	OKLAHOMA
OREGON	12/31	15,463,453	9,696,419	62.8	2,022,421	13.0	263,667	1.7	1,801,419	11.6	102,791	0.7	0.7	10.2	-	-	11,374	OREGON
PENNSYLVANIA	12/31	62,262,366	38,374,352	61.6	12,933,769	20.8	3,762,047	6.0	2,266,580	3.6	556,284	0.9	0.9	2.3	-	-	13,718,273	PENNSYLVANIA
RHODE ISLAND	11/30	3,045,366	813,922	26.7	1,507,604	49.5	341,658	11.2	96,020	3.2	131,327	4.3	4.3	1.6	-	-	1,002,173	RHODE ISLAND
SOUTH CAROLINA	12/31	9,132,953	5,423,522	59.4	2,624,385	28.7	394,034	4.3	-	-	746,816	8.2	8.2	2.6	-	-	131,280	SOUTH CAROLINA
SOUTH DAKOTA	12/31	6,374,176	4,253,562	66.7	646,556	10.3	393,556	6.2	313,750	4.9	28,727	0.4	0.4	0.1	-	-	226,456	SOUTH DAKOTA
TENNESSEE	12/31	14,375,139	9,243,491	64.3	1,560,066	10.9	1,075,362	7.5	-	-	2,430,142	17.2	17.2	0.1	-	-	651,691	TENNESSEE
TEXAS	12/31	19,636,007	8,607,724	43.8	10,395,219	52.0	346,381	1.7	-	-	445,269	2.2	2.2	1.0	-	-	150,354	TEXAS
UTAH	12/31	4,123,758	1,949,461	47.3	580,765	14.1	58,934	1.4	336,400	8.1	131,677	3.2	3.2	11.2	-	-	631,672	UTAH
VERMONT	12/31	3,419,327	1,862,636	54.5	1,356,652	39.4	100,070	2.9	-	-	-	-	-	-	-	-	350,236	VERMONT
VIRGINIA	6/30	14,071,466	9,408,977	67.0	2,964,720	21.1	313,252	2.2	-	-	306,000	2.2	2.2	0.7	-	-	612,922	VIRGINIA
WASHINGTON	12/31	1,973,628	1,242,450	62.9	1,242,450	62.9	629,388	31.9	-	-	-	-	-	-	-	-	-	WASHINGTON
WEST VIRGINIA	12/31	16,138,729	8,941,142	55.4	1,258,695	7.8	1,165,912	7.2	1,310,861	8.1	-	-	-	0.1	-	-	7,438,657	WEST VIRGINIA
WISCONSIN	6/30	7,734,733	3,096,943	40.0	3,294,375	42.4	279,876	3.6	-	-	174,176	2.2	2.2	0.5	-	-	1,364,214	WISCONSIN
WYOMING	12/31	3,973,454	2,277,323	57.3	524,120	13.2	149,398	4.7	146,164	3.7	304,270	7.7	7.7	0.8	-	-	103,537	WYOMING
TOTALS		\$649,125,101	\$386,906,871	59.6	\$119,303,560	18.4	\$30,507,047	4.7	\$27,936,669	4.3	\$22,497,230	3.5	3.5	1.6	-	-	\$130,956,191	TOTALS

REMARKS: THE DISBURSEMENTS SHOWN ABOVE IN GENERAL COVER MONEY SPENT ON STATE HIGHWAYS.

NOTES: (1) THE FISCAL YEAR FOR ROAD WORK ENDS IN 8 STATES ON JUNE 30, IN 3 STATES ON SEPTEMBER 30, IN 5 STATES ON NOVEMBER 30 AND IN 32 STATES ON DECEMBER 31. (2) INCLUDES RETIREMENTS AND SINKING FUNDS. (3) INCLUDES REPAIRS, RENTALS AND PURCHASES. (4) INCLUDES REIMBURSEMENT TO COUNTIES, TOWNS, ETC., PURCHASES OF RIGHT-OF-WAY AND TRAFFIC CONTROL POLICING SIGNS, ETC. (5) INCLUDES PAYMENTS FOR INTEREST AND REDEMPTIONS OF COUNTY PRIMARY ROAD BONDS. (6) DEFICIT OF \$4,804,126. (7) SMALL AMOUNT OF RETIREMENTS INCLUDED WITH INTEREST PAID ON COUNTY BOND OBLIGATIONS BY STATE. (8) DEFICIT OF \$107,344. (9) MAINTENANCE TAKEN OVER BY STATE JULY 1, 1925, FORMERLY DONE BY COUNTIES: AMOUNT SHOWN IN STATE'S SHARE BEFORE JULY 1. (10) INCLUDES \$1,117,344 EXPENDED ON FEDERAL AID FOR ENGINEERING, DEDUCTED FROM CONSTRUCTION AND MAINTENANCE ON A PRO RATA BASIS. (11) INCLUDES \$1,403,633 FOR REEQUIPMENT AND CONTROL OF MOTOR VEHICLES. (12) DEFICITS OF KENTUCKY AND NEVADA ALLOWED FOR IN THIS TOTAL.

SOIL EXPERTS CAN HELP HIGHWAY ENGINEER

EXTRACT FROM U. S. DEPARTMENT OF AGRICULTURE
CLIP SHEET No. 434, PAGE 2.

"KNOWLEDGE OF THE PROPERTIES, CONSTITUENTS, AND BEHAVIOR OF DIFFERENT TYPES OF SOIL HAS NOT ONLY AN AGRICULTURAL BEARING BUT IS OF GREAT IMPORTANCE TO THE HIGHWAY ENGINEER. HENCE IT OFTEN BECOMES NECESSARY FOR THE SPECIALISTS OF THE BUREAU OF SOILS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE TO COOPERATE WITH THOSE OF THE BUREAU OF PUBLIC ROADS IN INVESTIGATIONS IN LOCALITIES HAVING PECULIAR SOIL CONDITIONS TO THROW LIGHT ON PROBLEMS IN HIGHWAY ENGINEERING.

"IT HAS BEEN SHOWN FOR INSTANCE, THAT THE CLAY SOILS IN THE EASTERN PART OF TEXAS AND IN THE PIEDMONT REGION POSSESS THE PROPERTIES INDICATED BY A LOW RATIO OF SILICA TO IRON PLUS ALUMINA, AND ARE PROBABLY THE BEST TO MEET THE REQUIREMENTS OF GOOD HIGHWAY SUBGRADE MATERIAL. IN SOUTHEASTERN OHIO, AGAIN, IT WAS FOUND THAT HILLSIDE SLIPPING OF MASSES OF SOIL AND SUBSOIL MATERIAL IN THE EXTENSIVE AREA OF UPSHUR SOILS OF THAT REGION HAD COMPLETELY DEMOLISHED SECTIONS OF RECENTLY LAID CONCRETE ROADS. SIMILAR DESTRUCTIVE SLIDING CONNECTED WITH THIS TYPE OF SOIL HAS OCCURRED IN SOUTHWESTERN PENNSYLVANIA AND IN MANY PARTS OF WEST VIRGINIA. THE PROBLEM SEEMS TO BE ONE THAT WILL REQUIRE SERIOUS ATTENTION FROM HIGHWAY ENGINEERS. ANOTHER EXAMPLE OF THE COOPERATION BETWEEN SOIL AND ROAD EXPERTS IS THE BLACK WAXY BELT OF TEXAS, WHERE, IN THE OPINION OF THE SOIL EXPERT, THE BLACK CLAY OF THE REGION IS NOT THE BEST MATERIAL UPON WHICH TO LAY HARD SURFACING. IT TENDS TO SWELL AND SHRINK ACCORDING TO EXTREMES OF MOISTURE. OTHER AVAILABLE ROAD MATERIAL IS ADVISED FOR USE IN THE SUBGRADE."

SIXTH ANNUAL MEETING OF THE HIGHWAY RESEARCH BOARD

THE SIXTH ANNUAL MEETING OF THE HIGHWAY RESEARCH BOARD OF THE NATIONAL RESEARCH COUNCIL WILL BE HELD IN WASHINGTON, D. C., FROM DECEMBER 2 TO 3, 1926, IN THE BUILDING OF THE NATIONAL ACADEMY OF SCIENCES AND THE NATIONAL RESEARCH COUNCIL.

INTERSTATE COMMERCE COMMISSION MOTOR TRANSPORT HEARINGS

THE HEARINGS OF THE INTERSTATE COMMERCE COMMISSION ON THE NECESSITY FOR THE REGULATION OF MOTOR BUS AND TRUCK INTER-STATE TRANSPORTATION WERE CONCLUDED WITH THE FINAL SESSION IN WASHINGTON, D. C., FROM OCTOBER 25 TO 27. THE BUREAU WAS REPRESENTED BY MR. MACDONALD, DR. MCKAY AND CAPTAIN CURTISS.

THE FIRST DEFINITE OPPOSITION TO THE FEDERAL REGULATION OF INTERSTATE MOTOR BUS AND TRUCK TRAFFIC DEVELOPED DURING THE THIRD DAY OF THE SESSION. T. C. ATKESON, THE WASHINGTON REPRESENTATIVE OF THE NATIONAL GRANGE DECLARED THAT SINCE THE HIGHWAYS ARE OUTSIDE OF FEDERAL JURISDICTION, EXCEPT IN SO FAR AS THEY CARRY THE MAILS, THE INTERSTATE COMMERCE COMMISSION "IS WITHOUT AUTHORITY TO TAKE COGNIZANCE AND CONTROL OVER THEM."

"ADMITTEDLY, HOWEVER," MR. ATKESON CONTINUED, "THE CONTROL OF THE ROAD AND OF THE TRAFFIC OVER THIS ROAD MAY BE ASSUMED AND TAKEN OVER BY A STATE." HE REFUTED THE ARGUMENT THAT BECAUSE THE TRANSPORTATION OF PERSONS OR PROPERTY OR BOTH OVER HIGHWAYS BY MOTOR TRUCKS OR MOTOR BUSES IS IN COMPETITION WITH THE RAILROADS THAT IT THEREFORE INFLUENCES THE INTERSTATE BUSINESS OF THE RAILROADS EVEN THOUGH THE BUSINESS OF THE MOTOR TRANSPORT AGENCIES MAY BE INTRASTATE. HE ADDED "THE ARGUMENT THAT TRAFFIC ON MOTOR TRUCKS OR BUSES WHICH PROCEEDS TO OR FROM A RAILROAD TERMINAL, TO BE, OR WHICH HAS BEEN MOVED BY RAIL IN INTERSTATE COMMERCE, IS THEREBY MADE 'INTERSTATE' IS A VERY FAR FETCHED ARGUMENT." * * *

"THE FARM PRODUCERS WHO USE THIS FORM OF TRANSPORTATION, AND WHO ARE INCREASING THIS USE DAY BY DAY, WANT SAFE ROADS AND COMPETITIVE PRICES. WHILE MOST OF THIS IS DONE IN OWNER-OPERATED VEHICLES, EVERY FARMER - OPERATOR WISHES FREEDOM OF CHOICE BETWEEN USING HIS OWN VEHICLE AND TIME ON THE ROAD, OR USING A TRUCK FOR HIRE, RELEASING HIS LABOR, ATTENTION AND VEHICLE FOR PURPOSES OF PRODUCTION. PROVIDED THAT THE ROAD IS KEPT UP AND THAT IT IS KEPT SAFE, HIS FURTHER INTEREST LIES IN THE UTMOST FREEDOM OF THIS WHOLE GREAT FABRIC OF ACTIVITY FROM INTERFERENCE, REGULATION OR IMPEDIMENT."

MR. MACDONALD ON THE FINAL DAY IN CONCLUDING A STATEMENT BEGUN THE PREVIOUS DAY, STATED HIS BELIEF THAT COOPERATION BETWEEN THE STATES UNDER POWER DELEGATED BY CONGRESS WOULD SERVE TO REGULATE INTERSTATE MOTOR BUS AND TRUCK TRANSPORTATION.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

M-6 (1925)
R-S-A.

TOTAL EXISTING MILEAGE OF RURAL ROADS IN UNITED STATES (END OF 1925)
AND TOTAL MILES OF SURFACED ROADS, BOTH IN STATE HIGHWAYS AND LOCAL ROADS

STATES	TOTAL MILEAGE			MILES SURFACED ROADS		
	TOTAL RURAL ROADS	STATE HIGHWAYS	LOCAL ROADS	TOTAL SURFACED	STATE HIGHWAYS	LOCAL ROADS
ALABAMA	61,541	3,954	57,587	13,560	1,833	11,727
ARIZONA	22,582	2,044	20,538	3,191	1,453	1,738
ARKANSAS	74,865	8,295	66,570	6,499	3,795	2,704
CALIFORNIA	79,197	6,591	72,606	18,002	3,383	14,619
COLORADO	67,839	8,933	58,906	8,600	3,457	5,143
CONNECTICUT	13,346	1,872	11,474	2,610	1,725	885
DELAWARE	3,796	506	3,290	782	506	276
FLORIDA	30,263	4,490	25,773	9,844	2,195	7,649
GEORGIA	97,892	6,232	91,660	18,710	2,472	16,238
IDAHO	35,402	4,627	30,775	12,116	2,196	9,920
ILLINOIS	96,326	4,820	91,506	15,259	4,168	11,091
INDIANA	73,131	3,936	69,195	48,125	3,860	44,265
IOWA	102,921	6,674	96,247	5,986	3,029	2,957
KANSAS	127,964	7,386	120,578	3,195	963	2,232
KENTUCKY	68,704	8,000	60,704	17,231	2,272	14,959
LOUISIANA	39,803	7,000	32,803	5,184	3,822	1,362
MAINE	20,765	1,459	19,306	4,279	1,219	3,060
MARYLAND	14,868	2,429	12,439	4,689	2,429	2,260
MASSACHUSETTS	19,083	1,542	17,541	7,888	1,529	6,359
MICHIGAN	77,284	6,707	70,577	21,514	6,026	15,488
MINNESOTA	108,080	6,954	101,126	24,385	5,979	18,406
MISSISSIPPI	56,108	5,501	50,607	9,910	2,690	7,220
MISSOURI	110,500	7,640	102,860	10,658	2,601	8,057
MONTANA	67,177	7,957	59,220	1,189	859	330
NEBRASKA	87,168	5,619	81,549	2,501	1,881	620
NEVADA	23,171	2,997	20,174	1,252	874	378
NEW HAMPSHIRE	13,802	2,081	11,721	1,894	1,768	126
NEW JERSEY	17,722	1,290	16,432	7,608	1,182	6,426
NEW MEXICO	48,295	9,159	39,136	2,440	1,615	825
NEW YORK	81,873	13,900	67,973	26,363	9,626	16,737
NORTH CAROLINA	68,148	6,432	61,716	20,016	5,311	14,705
NORTH DAKOTA	106,498	6,174	100,324	1,785	804	981
OHIO	84,883	10,784	74,099	40,249	9,502	30,747
OKLAHOMA	134,262	5,589	128,673	1,686	1,348	338
OREGON	49,752	4,446	45,306	10,764	3,008	7,746
PENNSYLVANIA	92,759	10,828	81,931	18,958	7,656	11,302
RHODE ISLAND	2,374	768	1,606	777	406	371
SOUTH CAROLINA	64,634	4,951	59,683	10,061	3,221	6,840
SOUTH DAKOTA	116,906	5,918	110,988	3,007	2,023	984
TENNESSEE	65,321	4,644	60,677	13,325	2,599	10,726
TEXAS	167,685	16,668	151,017	20,115	7,954	12,161
UTAH	23,381	3,132	20,249	3,132	1,058	2,074
VERMONT	14,874	4,466	10,408	4,680	3,067	1,613
VIRGINIA	59,081	4,921	54,160	9,782	3,560	6,222
WASHINGTON	49,016	3,266	45,750	17,271	2,542	14,729
WEST VIRGINIA	35,243	3,664	31,579	1,628	1,263	365
WISCONSIN	78,964	10,264	68,700	28,318	7,978	20,340
WYOMING	46,576	3,143	43,433	907	802	105
TOTAL	3,001,825	270,653	2,731,172	521,915	145,509	376,406

